> indicative of operating temperature (e.g., thermocouple) and to signal the end of the starting period. (Roberts, col. 8, lines 44-50, emphasis added.)

In other words, to the extent that Roberts' methods involve restricting coolant flow, the restriction is done based on a measurement of a cell temperature parameter, not on one or more monitored voltages. Applicants can find no disclosure in Roberts of methods that include restricting coolant flow in a fuel cell or fuel cell stack based on one or more monitored voltages.

The Examiner has referred to two specific portions of Roberts to justify the rejection. (Office Action at page 4.) However, Applicants do not see how the cited portions or any other portions of Roberts justify the rejection.

The Examiner stated that "Roberts discloses that a 'voltage reversal occurs ... resulting in a negative cell voltage' (col. 7, lines 32-36)." (Id.) The portion of Roberts cited by the Examiner, reproduced in its entirety, states:

> A voltage reversal occurs in a cell when either the anode potential increases and becomes more positive than the cathode potential or the cathode potential decreases and becomes more negative than the anode potential, resulting in a negative cell voltage. In this situation the cell is consuming, rather than producing, electrical power. (Roberts, col. 7, lines 32-37.)

This is merely an explanation of the mechanisms by which a voltage reversal can occur in a fuel cell. This portion of Roberts does not disclose or suggest that voltage reversals do occur during operation of Roberts fuel cells, nor does it disclose or suggest what actions Roberts would take if a voltage reversal did occur. Certainly, this portion of Roberts does not disclose or suggest monitoring voltages of a set of fuel cells and restricting coolant flow when one or more of the monitored voltages decreases from a predetermined voltage range, as required by claims 24-29.

The Examiner also stated:

> [Roberts] also teaches that "starting the flow of coolant can initiate a cell voltage reversal in the cooler outermost cells. Thus, care should be taken with the timing and rate at which coolant flow is commenced to avoid voltage reversal and/or over-heating" (col. 8, lines 34-43). Therefore,

Roberts discloses restricting coolant flow when there is a decrease in voltage (voltage reversal). (Office Action at page 4.)

Applicants do not agree that the above portion of Roberts discloses or suggests restricting coolant flow based on one or more monitored voltages. According to Roberts, during start-up, coolant – if it is present at all – is initially not flowing in Roberts' fuel cells. Roberts states that "[p]referably during start-up, the fuel cell stack coolant (if present) is not circulated to allow rapid warming of the stack." (Roberts, col. 8, lines 35-37.) Roberts then discloses that coolant flow should be initiated to avoid overheating, but the rate at which coolant flow is introduced should be controlled: "[a]s the stack nears its normal operating temperature, interior cells in the stack may overheat if no coolant flow is provided, but starting the flow of coolant can initiate a cell voltage reversal in the cooler outermost cells." (Id., lines 37-40.)

According to Roberts (at col. 8, lines 40-43, as cited by the Examiner), under proper operating circumstances, voltage reversals are avoided by carefully controlling the timing and rate at which coolant flow is introduced into a fuel cell. That is, Roberts does not teach restricting coolant flow through the fuel cell stack, as required by claims 24-29, because no coolant is initially flowing to make restriction possible. Roberts teaches only the controlled introduction of coolant into a fuel cell stack, not the restriction of already-flowing coolant in a fuel cell stack.

With careful control over coolant introduction into his fuel cells, voltage reversals due to coolant flow should therefore not occur in Roberts' fuel cells. If a voltage reversal does occur, however, neither the cited portion of Roberts nor any other portion of Roberts discloses or suggests monitoring voltages of a set of fuel cells and restricting coolant flow when one or more of the monitored voltages decreases from a predetermined voltage range, as required by claims 24-29. In fact, Roberts does not disclose or suggest any course of action that includes restricting coolant flow in response to voltage reversals, because Roberts states that "cells in the stack may overheat if no coolant flow is provided." (Roberts, col. 8, lines 38-39.)

Roberts' disclosure relates to fuel cell starvation methods, and he states that "cell reversal caused by fuel starvation may result in the anode potential rising to the point where significant corrosion of the anode hardware occurs." (Id., col. 7, lines 40-43.) However, to remedy voltage

reversals in his fuel cells (regardless of how they arise), Roberts does not disclose restricting coolant flow through the fuel cell stack. Instead, Roberts states that "it may be preferable to introduce starvation conditions intermittently and to control the duration and frequency of the reactant starvations, using a suitable controller, to avoid prolonged cell voltage reversal." (Id., lines 45-49.)

Therefore, to the extent that Roberts discloses any method for correcting voltage reversals in his fuel cells, the method involves intermittent reactant starvation, not restricting coolant flow. As discussed above, restricting coolant flow in Roberts' fuel cells can have adverse consequences that include cell overheating. Thus, Roberts simply does not disclose methods that include "monitoring voltages of a set of fuel cells [and] restricting coolant flow through the fuel cell stack when one or more of the monitored voltages decreases from a predetermined voltage range" as required by claims 24-29.

In view of the foregoing, Applicants request reconsideration and withdrawal of the rejection of claims 24-29 under 35 U.S.C. § 102(e).

The Examiner rejected claims 1, 7-10, 12-23, and 30-38 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Roberts in view of Parise (U.S. Patent No. 6,057,050, "Parise").

Claims 1, 7-10, 12-23, and 30-38 cover methods that include monitoring voltages of a set of fuel cells and restricting coolant flow when one or more of the monitored voltages decreases from a predetermined voltage range. As explained above, Roberts does not disclose such methods. Nor in Roberts is there a suggestion to modify his methods to provide the methods covered by claims 1, 7-10, 12-23, and 30-38. Roberts' disclosure relates to fuel cell starvation techniques which are used to heat a fuel cell, especially during start-up. (See, e.g., Roberts, Abstract). Roberts' methods are apparently successful. He states that "[u]sing intermittent reactant starvation via shorting during the start-up period, cell B also reached a current density of 0.5 A/cm^2 from -5° C in a reasonable length of time." (Id., col. 10, lines 32-34.)

There would be no motivation to alter Roberts' methods to provide the subject matter of claims 1, 7-10, 12-23, and 30-38, at least because Roberts is apparently able to successfully start his fuel cells under cold conditions. Apparently, voltage reversals do not pose a significant problem for Roberts under normal circumstances. Roberts states that "the reactant starving

method may cause a voltage reversal to occur in at least one, but preferably not simultaneously in all, of the plurality of fuel cells" (id., col. 4, lines 63-66), but that preferably, "starvation is limited so that the voltage reversal is not prolonged." (Id., lines 66-67.) In other words, to the extent that Roberts discloses steps for correcting voltage reversals, the steps include intermittent fuel starvation, not restriction of coolant flow. (see, e.g., id., col. 7, lines 45-49). In fact, as discussed above, reducing or eliminating coolant flow may lead to overheating of Roberts' fuel cells. Therefore, in view of Roberts' disclosure, one of skill in the art would not be motivated to correct for voltage reversals in Roberts' fuel cells by restricting coolant flow. Instead, based upon Roberts, intermittent fuel starvation would be used to eliminate a voltage reversal.

Parise does not cure Roberts' deficiencies, at least because, like Roberts, Parise does not disclose or suggest the methods covered by claims 1, 7-10, 12-23, and 30-38. Parise discloses methods that include cooling batteries using thermoelectric cooling devices. (See, e.g., Parise, col. 2, lines 17-28). However, Parise does not disclose monitoring voltages of a set of fuel cells and restricting coolant flow through the fuel cell stack when one or more of the monitored voltages decreases from a predetermined voltage range, as required by claims 1, 7-10, 12-23, and 30-38. Instead, Parise's batteries are regulated based on a monitored temperature. Parise states that "[i]f the temperature within the cell is higher than a threshold temperature, established within the controller, the power source send a current 19 to thermoelectric generator 20 via power leads 17, 18 electrically connected to the thermoelectric generator at connections 21, 22." (Parise, col. 3, lines 30-35.) There is no disclosure in Parise that relates to regulating his batteries based on one or more monitored voltages.

To the extent that Parise's methods include the use of a coolant, Parise states that "[c]ooling fluid, such as water, flowing through the heat exchanger would transfer heat away from the hot plate to increase the amount of heat transferred from the battery." (Parise, col. 5, lines 10-13.) However, Parise does not disclose restricting coolant flow in response to one or more measured voltages, as required by claims 1, 7-10, 12-23, and 30-38. In fact, Parise does not disclose restricting coolant flow at all.

Accordingly, neither Roberts nor Parise, alone or in combination, disclose or suggest the methods covered by claims 1, 7-10, 12-23, and 30-38. There is no suggestion to combine these references to provide such methods. Even if the references were combined the result would not

be the methods covered by claims 1, 7-10, 12-23, and 30-38. Accordingly, Applicants request reconsideration and withdrawal of the rejection of claims 1, 7-10, 12-23, and 30-38 under 35 U.S.C. § 103(a).

Applicants believe the claims are currently in condition for allowance, which action is requested. Please apply any charges or credits to deposit account 06-1050, referencing Attorney Docket No. 10964-057001.

Respectfully submitted,

Date: 9/28/06

Sean P. Daley
Reg. No. 40,978

Fish & Richardson P.C.
225 Franklin Street
Boston, MA 02110
Telephone: (617) 542-5070
Facsimile: (617) 542-8906